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Notes on *Trametes* (*Basidiomycota*) in China

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Abstract —Four *Trametes* species, *T. ellipsospora*, *T. maxima*, *T. mimetes,* and *T. tephroleuca,* are reported as new for the Chinese fungal flora. Illustrated descriptions of these species are given according to the Chinese materials. A key is provided to the twenty-six species recorded in China. The relationships of Chinese *Trametes* spp. and related genera are discussed.

Key words — *Polyporaceae*, taxonomy, wood-decaying fungi

Introduction

Trametes Fr. was established based on *T. suaveolens* (L.) Fr. as type species by Fries (1836). The genus is characterized by pileate basidiocarps, a trimitic hyphal system with clamp connections on generative hyphae, hyaline and thin-walled basidiospores that are negative in Melzer's reagent, and species that cause a white rot (Gilbertson & Ryvarden 1987, Núñez & Ryvarden 2001, Ryvarden & Gilbertson 1994). *Trametes* was considered as one of the most complicated genera in the *Polyporaceae*. Many species in the genus share similar basidiospores. Many taxonomic studies have been carried out during the last thirty years (Corner 1989, Dai et al. 2007a, Gilbertson & Ryvarden 1987, Hattori 2005, Ko & Jung 1999a,b, Læssøe & Ryvarden 2010, Li & Cui 2010, Núñez & Ryvarden 2001, Quanten 1996, Roy & De 1996, Ryvarden 2004, 2009, Ryvarden & Iturriaga 2003, Ryvarden & Johansen 1980, Tomšovský 2008, Tomšovský et al. 2006, Zhang et al. 2006, Zhao 1998, Zhao et al. 1983), and around 50 species in the genus are accepted worldwide (Kirk et al. 2008). Twenty-two species were recorded in China previously (Cui et al. 2008, Dai 2009, Dai & Penttilä 2006, Dai & Yuan 2010, Dai et al. 2003, 2004, 2007a,b,c,d, 2009a, Li & Cui 2010, Li et al. 2007, 2008, Teng 1996, Wang et al. 2009, Yuan & Dai 2008, Zhao 1998, Zhao & Zhang 1991). Among them, six species are considered medicinal fungi (Dai & Yang 2008, Dai et al. 2009b).

During our study of *Trametes* in China, four species were newly identified and are briefly described here based on the Chinese materials. A key to the

Chinese species of *Trametes* is provided, and relationships among the related species are discussed.

Materials & methods

The studied specimens were deposited in herbaria as cited below. All the materials were examined under microscope Nikon ECLIPSE 80i. Sections were studied under magnification up to ×1000. In presenting the variation in the size of the spores, 5% of the measurements were excluded from each end of the range, and are given in parentheses. The width of a basidium was measured at the thickest part, and the length was measured from the apex (sterigmata excluded) to the basal septum. In the text the following abbreviations were used: L = mean spore length (arithmetical average of all spores), W = mean spore width (arithmetical average of all spores), Q = variation in the L/W ratios among the specimens studied (quotient of the mean spore length and the mean spore width of each specimen), n = number of spores measured from given number of specimens. IKI = Melzer's reagent, IKI– = both inamyloid and nondextrinoid; KOH = 5% potassium hydroxide; CB = Cotton Blue, CB– = acyanophilous, CB+ = cyanophilous. Drawings were made with the aid of a drawing tube. Special color terms are from Petersen (1996).

Taxonomy

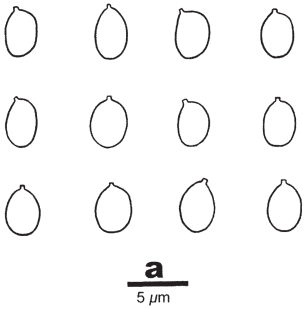
Trametes ellipsospora Ryvarden, Mycotaxon 28(2): 539, 1987. Fig. 1

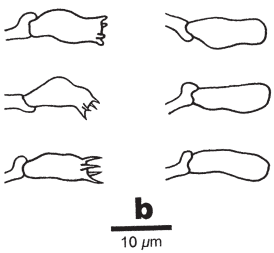
Fruitbody — Basidiocarps annual, pileate to effused-reflexed, usually imbricate, without odour or taste when fresh, soft coriaceous and light in weight when dry. Pilei semicircular to almost circular with a umbilicate base, projecting up to 2.5 cm long, 3 cm wide, 2 mm thick at base; pileal surface cream, clay-buff to pale gray after drying, velutinate, slightly concentrically zonate and sulcate, irregular warts or protuberances occasionally present near the base; margin thin and sharp. Pore surface cream to straw-colored, glancing; pores round to angular, 4–6 per mm; dissepiments thin, entire. Context cream, coriaceous, up to 1.3 mm thick. Tube layer cream to pale straw-colored, coriaceous, up to 0.7 mm long.

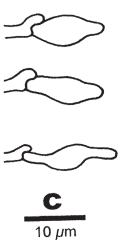
Hyphal structure — Hyphal system trimitic; generative hyphae bearing clamp connections; skeletal and binding hyphae dominant, thick-walled to subsolid, IKI–, CB–; tissue unchanged in KOH.

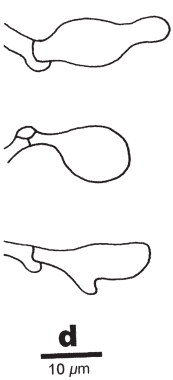
Context — Generative hyphae scanty, hyaline, thin-walled, branched, 2–3 μm in diam; skeletal hyphae dominant, hyaline, thick-walled to subsolid, branched, sometimes collapsed, interwoven, 2.8–5 μm in diam; binding hyphae hyaline, thick-walled to almost solid, branched, interwoven, 1.5–3.2 μm in diam.

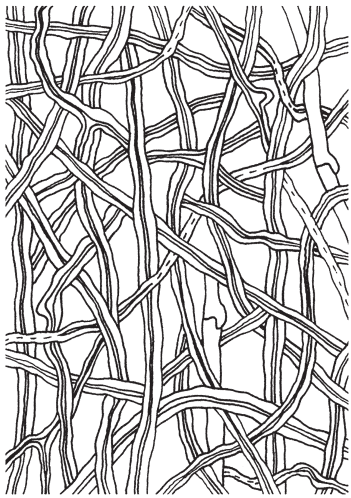
Tubes — Generative hyphae infrequent, hyaline, thin-walled, rarely branched, 1.5–3 μm in diam; skeletal hyphae dominant, hyaline, thick-walled to subsolid, branched, interwoven, 2–3.5 μm; binding hyphae hyaline, flexuous,











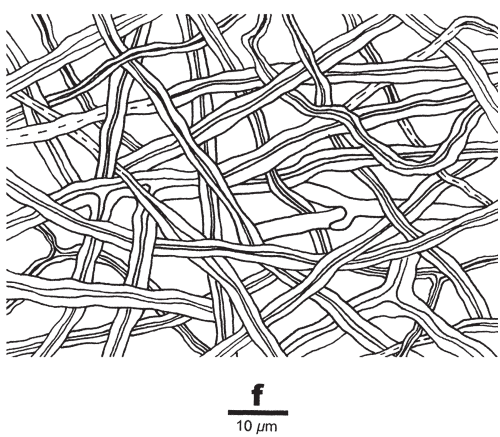


Fig. 1. Microscopic structures of *Trametes ellipsospora* (drawn from Cui 6259).
a: Basidiospores. b: Basidia and basidioles. c: Cystidioles.
d: Facial cystidia. e: Hyphae from tube. f: Hyphae from context.

thick-walled to almost solid, branched, 1.6–3.2 μm. Facial cystidia occasionally present, globose, pyriform, clavate to fusoid, hyaline, thin-walled, 11–25 × 7–10.5 μm; fusoid cystidioles occasionally present in the hymenium, hyaline, thin-walled, 13–19 × 3–4.5 μm; basidia clavate, with four sterigmata and a basal clamp connection, 9–17 × 3.7–5 μm; basidioles in shape similar to basidia, but slightly smaller.

Spores — Basidiospores ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–, (3–)3.2–4.6(–5.1) × (2.1–)2.6–3.2(–3.5) μm, L = 3.86 μm, W = 2.98 μm, Q = 1.29–1.31 (n = 90/3).

Specimens examined — **CHINA. Yunnan Province**, Mengla County, Xishuangbanna Botanical Garden, on fallen angiosperm trunk, 31.X.2009 Cui 8343 (BJFC). **Hainan Province**, Chengmai County, on fallen angiosperm trunk, 6.V.2009 Cui 6259 (BJFC); Wanning County, Tianmao, on fallen angiosperm trunk, 14.V.2009 Cui 6665 (BJFC).

Remarks — *Trametes ellipsospora* is characterized by its small ellipsoid basidiospores. Our collections fit all the characters except its upper surface, which was originally described as glabrous (Ryvarden 1987). After studying one authentic specimen collected by Ryvarden, however, we found that it also is velutinate. One specimen collected from Yunnan Province, Southwest China, seems unique, because although cystidia are usually absent in *Trametes,* different kinds of facial cystidia were observed on or near the pore surface.

Trametes ellipsospora resembles *T. marianna* (Pers.) Ryvarden, but the latter species has cylindrical basidiospores (6–7 × 2–2.5 μm; Ryvarden & Johansen 1980). *Trametes pavonia* (Hook.) Ryvarden, which resembles *T. ellipsospora* in velutinate pileus and small pores (5–6 per mm), can be separated by larger basidiospores (5–6 × 3–4 μm; Gilbertson & Ryvarden 1987).

Trametes maxima (Mont.) A. David & Rajchenb., Mycotaxon 22(2): 315, 1985. Fig. 2

Fruitbody — Basidiocarps annual, pileate, solitary or imbricate, without odour or taste when fresh, corky and light in weight when dry. Pileus semicircular to dimidiate, projecting up to 2.5 cm long, 3.4 cm wide, 2 mm thick at base; pileal surface buff-yellow to cinnamon-buff after drying, glabrous, concentrically zonate and sulcate; margin thin, entire or slightly wavy. Pore surface cinnamon-buff to cinnamon; pores angular, 3–4 per mm; dissepiments thin, slightly lacerate. Context cream, corky, up to 1.2 mm thick, a black line present towards upper surface. Tube layer concolourous with pore surface, corky, up to 0.8 mm long.

Hyphal structure — Hyphal system trimitic; generative hyphae bearing clamp connections; skeletal and binding hyphae dominant, thick-walled to subsolid, IKI–, CB–; tissue unchanged in KOH.

Context — Generative hyphae scanty, hyaline, thin-walled, rarely branched, 1.9–3 μm in diam; skeletal hyphae dominant, hyaline, thick-walled to subsolid,

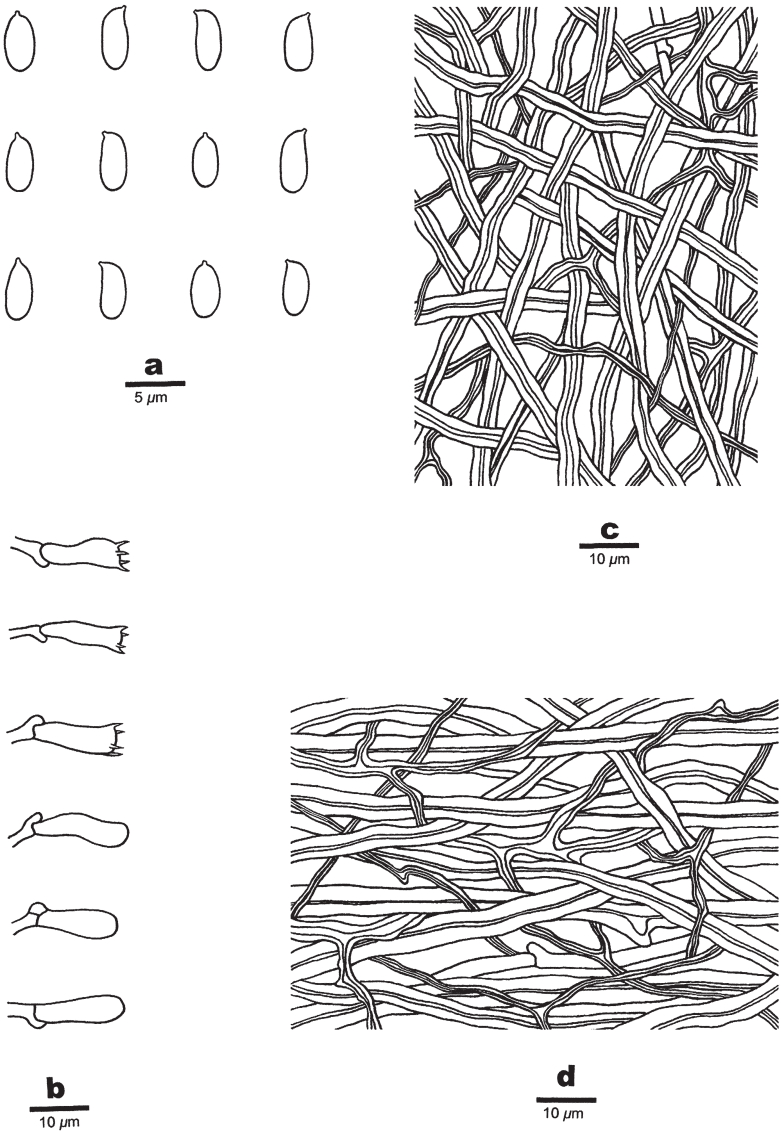


Fig. 2. Microscopic structures of *Trametes maxima* (drawn from Dai 6865).
a: Basidiospores. b: Basidia and basidioles. c: Hyphae from tube. d: Hyphae from context.

branched, interwoven, 3–5.5 μm in diam; binding hyphae hyaline, thick-walled to subsolid, frequently branched, interwoven, 1.2–3.2 μm in diam.

Tubes — Generative hyphae infrequent, hyaline, thin-walled, rarely branched, 1.6–2.4 μm in diam; skeletal hyphae dominant, hyaline, thick-walled to subsolid, branched, interwoven, 2.5–3.8 μm; binding hyphae hyaline, thick-walled to subsolid, frequently branched, interwoven, 0.8–2.5 μm. Cystidia and cystidioles absent; hyphal pegs occasionally present; basidia clavate, with four sterigmata and a basal clamp connection, 10–15 × 3–5 μm; basidioles in shape similar to basidia, but slightly smaller.

Spores — Basidiospores oblong ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–, (4.1–)4.2–5.1(–5.8) × 2–2.4(–2.5) μm, L = 4.78 μm, W = 2.18 μm, Q = 2.19 (n = 30/1).

Specimen examined — **CHINA. Yunnan Province**, Menglun County, Xishuangbanna Botanical Garden, on fallen angiosperm trunk, 6.VIII.2005 Dai 6865 (BJFC).

Remarks — *Trametes maxima* is characterized by its buff-yellow to cinnamon-buff, glabrous, concentrically zoned, sulcate pileus, its lacerate pore surface, and the black line in the context towards the upper surface.

Trametes cystidiolophora B.K. Cui & H.J. Li resembles *T. maxima* in an uneven pore surface and pore size (2–3 per mm), but *T. cystidiolophora* differs by its pale grayish brown to pale cinnamon-buff pileal surface with distinctly concentric zones and radial veins and larger basidiospores (6.6–9.2 × 2.4–3 μm; Li & Cui 2010).

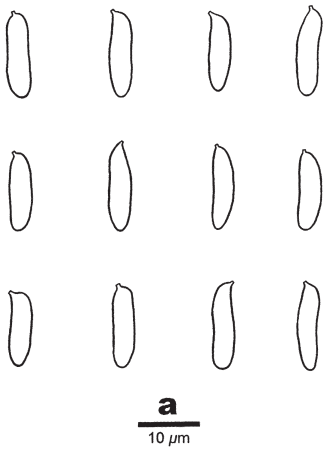
A black zone is also present in *T. hirsuta* (Wulfen) Pilát and *T. versicolor* (L.) Lloyd, but they have distinctly cylindrical basidiospores.

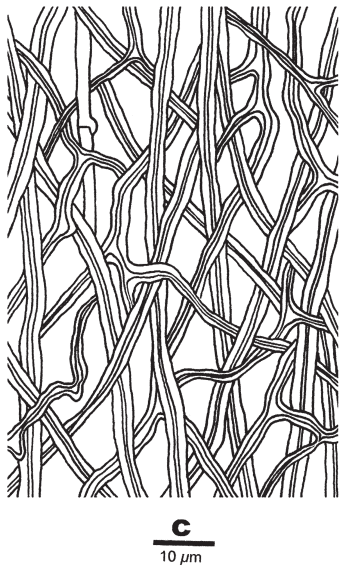
Trametes mimetes (Wakef.) Ryvarden, Norweg. J. Bot. 19: 236, 1972. Fig. 3

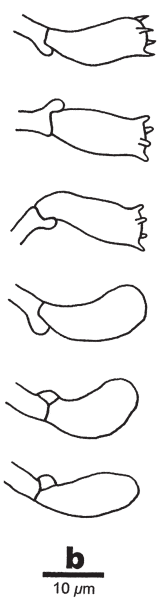
Fruitbody — Basidiocarps annual, pileate to effused-reflexed, usually imbricate, without odour or taste when fresh, coriaceous to corky and light in weight when dry. Pileus semicircular to dimidiate, projecting up to 1.1 cm long, 2.7 cm wide, 3.5 mm thick at the base; pileal surface cream to buff after drying, glabrous, narrowly concentrically zonate and sulcate and radially wrinkled; margin thin and sharp, entire or slightly lobed and incised. Pore surface buff to buff-yellow, glancing; pores round, 3–4 per mm; dissepiments thin, entire. Context cream, corky, up to 0.8 mm thick. Tube layer buff to buff-yellow, corky, up to 2.7 mm long.

Hyphal structure — Hyphal system trimitic; generative hyphae bearing clamp connections; skeletal and binding hyphae dominant, thick-walled to subsolid, IKI–, CB–; tissue unchanged in KOH.

Context — Generative hyphae scanty, hyaline, thin-walled, rarely branched, 2.5–3.5 μm in diam; skeletal hyphae dominant, hyaline to pale yellowish, thick-walled with a wide lumen, branched, interwoven, 2.5–5 μm in diam; binding hyphae hyaline to pale yellowish, thick-walled to almost solid, frequently branched, interwoven, 1.2–3.5 μm in diam.







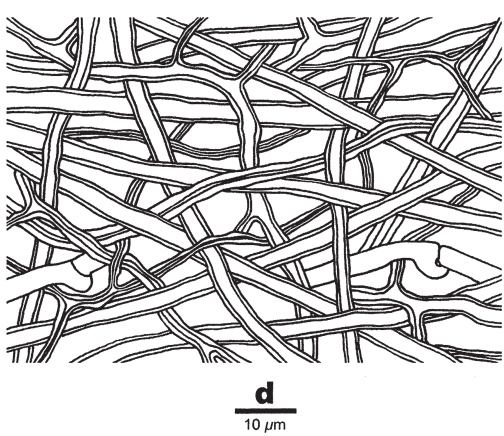


Fig. 3. Microscopic structures of *Trametes mimetes* (drawn from Dai 10608).
a: Basidiospores. b: Basidia and basidioles. c: Hyphae from tube. d: Hyphae from context.

Tubes — Generative hyphae infrequent, hyaline, thin-walled, rarely branched, 1.8–2.5 μm in diam; skeletal hyphae dominant, hyaline to pale yellowish, thick-walled with a wide to narrow lumen, frequently branched, interwoven, 2–3.3 μm; binding hyphae hyaline to pale yellowish, flexuous, thick-walled to almost solid, frequently branched, interwoven, 1–3 μm. Cystidia and cystidioles absent; hyphal pegs occasionally present; basidia clavate, with four sterigmata and a basal clamp connection, 16–20 × 6–7 μm; basidioles in shape similar to basidia, but slightly smaller.

Spores — Basidiospores cylindrical, hyaline, thin-walled, smooth, IKI–, CB–, (10–)10.2–12.8(–14) × 3–4 μm, L = 11.56 μm, W = 3.53 μm, Q = 3.27 (n = 30/1).

Specimen examined — **CHINA**. **Jiangxi Province**, Jinggangshan County, Jinggangshan Nature Reserve, on fallen angiosperm trunk, 23.IX.2008 Dai 10608 (BJFC).

Remarks — *Trametes mimetes* is characterized by its glabrous, concentrically zoned, sulcate, radially wrinkled pileus and large cylindric basidiospores. Ryvarden & Johansen (1980) describe the pileal surface as ochraceous or fulvous to dark brown; the Chinese specimen is paler, its pores are slightly smaller (2–3 per mm), and its basidiospores are larger than the 8–11 × 3.2–4 μm given by Ryvarden & Johansen (1980).

Trametes tephroleuca Berk., Hooker's J. Bot. Kew Gard. Misc. 6: 165, 1854. Fig. 4

Fruitbody — Basidiocarps annual, pileate, solitary or imbricate, corky when dry; pilei semicircular, dimidiate to flabelliform; projecting up to 5 cm, 7.8 cm wide, and 1.2 cm thick at the base; margin obtuse. Pileal surface cream to pale brown when dry, concentrically sulcate or not, strigose to hirsute; pore surface cream to pale buff, becomes gray with age; pores round to angular, 1–2 per mm; dissepiments moderately thick, entire; context cream, corky when dry, up to 7 mm thick, a black line occasionally present towards the upper surface; tubes cream and become gray with age, corky when dry, up to 5 mm long.

Hyphal structure — Hyphal system trimitic; generative hyphae bearing clamp connections; skeletal and binding hyphae IKI–, CB–; tissue unchanged in KOH.

Context — Generative hyphae hyaline, thin-walled, 1.5–4.8 μm in diam; skeletal hyphae hyaline, thick-walled to subsolid, most with a narrow lumen, usually collapsed when with a wide lumen, branched, more or less regularly arranged, 2.3–6.5 μm in diam; binding hyphae hyaline, thick-walled to subsolid, frequently branched, strongly interwoven, 1.2–3 μm in diam.

Tubes — Generative hyphae hyaline, thin-walled, 1.3–3.5 μm in diam; skeletal hyphae hyaline, thick-walled to subsolid, branched, interwoven, sometimes projecting into the hymenium with or without a thin-walled and

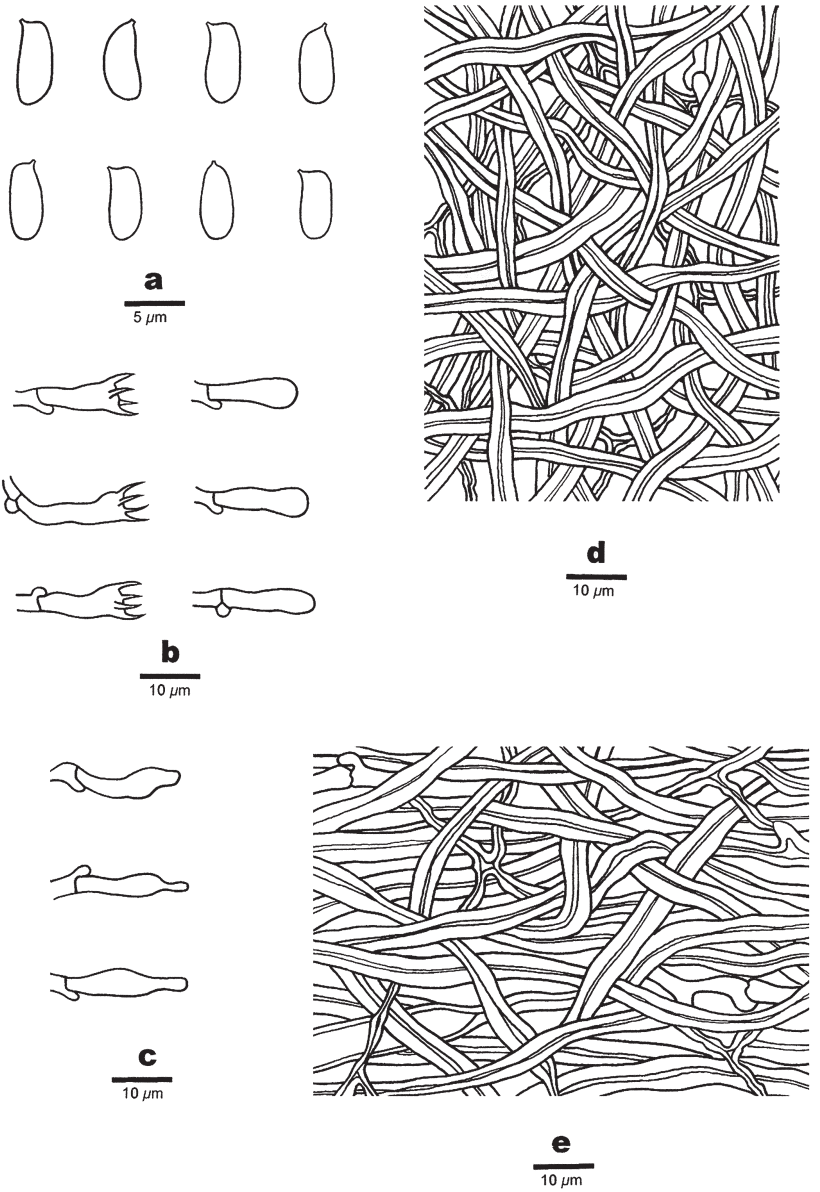


Fig. 4. Microscopic structures of *Trametes tephroleuca* (drawn from Cui 7977).
a: Basidiospores. b: Basidia and basidioles. c: Cystidioles.
d: Hyphae from trama. e: Hyphae from context.

inflated tip, 2–5 μm in diam; binding hyphae hyaline, thick-walled to subsolid, frequently branched, strongly interwoven, 1–2.3 μm in diam; cystidia absent, fusoid cystidioles occasionally present, 13–17 × 4–6 μm; basidia clavate to barrel-shaped, with four sterigmata and a basal clamp connection, 12–16 × 4–5.5 μm; basidioles in shape similar to basidia, but slightly smaller.

Spores — Basidiospores cylindrical to oblong ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–, (4.5–) 4.8–7(–9) × (2–) 2.5–3.3 μm, L = 5.87 μm, W = 2.88 μm, Q = 1.90–2.19 (n = 60/2).

Specimens examined — **CHINA. Yunnan Province,** Tengchong County, Gaoligong Mountains, on fallen angiosperm trunk, 23.X.2009 Cui 7977, 7981 & 7987 (BJFC).

Remarks — *Trametes tephroleuca* is characterized by its strigose to hirsute pileus and pores that turn grayish with age. Berkeley (1854) described it from Nepal and Roy & De (1996) reported it from India. The species resembles *T. hirsuta*, characterized by similar basidiocarps and pores that age grayish to blackish, but differs in smaller pores (3–4 per mm) and narrower basidiospores (6–9 × 2–2.5 μm; Núñez & Ryvarden 2001).

Key to species of *Trametes* in China

(spore dimensions are provided after species names)

1. Basidiocarps with sterile cup-shaped structures. . . . . ***T. conchifera*** (Schwein.) Pilát
   6.1–8 × 2–2.9 μm, L = 7.2 μm, W = 2.2 μm, Q = 3.3 (n = 30/1)
1. Basidiocarps without sterile cup-shaped structures. 2
2. Pileus cream, with strong anise odour when fresh. . . . . ***T. suaveolens***
   6.5–9 × 3–3.7 μm, L = 7.3 μm, W = 3.2 μm, Q = 2.1–2.4 (n = 60/2)
2 Pileus cream to brown to gray, without anise odour when fresh. 3
3. Pores 1–3 per mm, or even larger 4
3. Pores 3–10 per mm 12
4. Hymenophore become grayish with age . . . . . ***T. tephroleuca***
   4.8–7 × 2.5–3.3 μm, L = 5.9 μm, W = 2.9 μm, Q = 1.9–2.2 (n = 60/2)
4. Hymenophore never become grayish. 5
5. Pileus persistently velutinate, strigose to tomentose 6
5. Pileus more or less glabrous. 9
6. Basidiospores < 5.5 μm long 7
6. Basidiospores > 5.5 μm long 8
7. Pileus velutinate to glabrous, pores radially elongated . . . . . ***T. gibbosa*** (Pers.) Fr.
   3.1–4.9 × 1.9–2.5 μm, L = 4.1 μm, W = 2.1 μm, Q = 2 (n = 60/2)
7. Pileus strigose to tomentose, pores angular. . . . . ***T. pocas*** (Berk.) Ryvarden
   4.2–5.5 × 2.4–3 μm, L = 4.8 μm, W = 2.7 μm, Q = 1.8 (n = 30/1)
8. Pileus velutinate, context duplex. . . . . ***T. subsuaveolens*** B.K. Cui & Y.C. Dai
   (5.2–)5.6–7.2(–8.2) × (2.3–)2.3–3(–3.1) μm, L = 6.38 μm, W = 2.56 μm, Q = 2.46–2.52 (n = 60/2)
8. Pileus strigose to tometose, context homogeneous . . . . . ***T. villosa*** (Sw.) Kreisel
   5.5–8.5 × 2.5–3.5 μm (Gilbertson & Ryvarden 1987)

9. Hymenophore irregular, often different from the base to the margin ..... ***T. elegans*** (Spreng.) Fr.
5.8–7 × 2.3–3 μm, L = 6.3 μm, W = 2.8 μm, Q = 2.3 (n = 60/2)

9. Hymenophore regular, angular to circular 10

10. Pore surface distinctly dentate to form a hydnoid surface ..... ***T. cystidiolophora***
6.6–9.2 × 2.4–3 μm, L = 8.1 μm, W = 2.8 μm, Q = 2.8–3.0 (n = 60/2)

10. Pore surface even.....11

11. Distributed in warm temperate China, pores 1.5–2 per mm ***T. lactinea*** (Berk.) Sacc.
5.2–6.7 × 2.1–2.8 μm, L = 6 μm, W = 2.3 μm, Q = 2.6 (n = 30/1)

11. Distributed in tropical to subtropical China, pores 2–3 per mm ..... ***T. orientalis*** (Yasuda) Imazeki
6–8 × 2.6–3.1 μm, L = 7.1 μm, W = 2.9 μm, Q = 2.5 (n = 30/1)

12. Pileus persistently velutinate, tometose to hirsute 13

12. Pileus more or less glabrous.....18

13. Hymenophore become grayish or even darker with age ..... ***T. hirsuta***
5.5–8 × 2.5–3.3 μm, L = 6.5 μm, W = 2.9 μm, Q = 2.1–2.6 (n = 270/9)

13. Hymenophore never become grayish or black 14

14. Basidiospores ellipsoid 15

14. Basidiospores cylindrical 16

15. Pileus multizonate, more or less ochraceous..... ***T. pavonia***
4.4–5.2 × 2.9–3.3 μm, L = 4.9 μm, W = 3 μm, Q = 1.6 (n = 30/1)

15. Pileus slightly concentrically zonate and sulcate, cream to clay-buff ***T. ellipsospora***
3.2–4.6 × 2.6–3.2 μm, L = 3.9 μm, W = 3 μm, Q = 1.3 (n = 90/3)

16. Pileus with a black layer between context and upper tomentum ..... ***T. versicolor***
4–5 × 1.7–2 μm, L = 4.4 μm, W = 1.9 μm, Q = 2.3 (n = 30/1)

16. Pileus without a black layer between context and upper tomentum 17

17. Pileal surface cream to warm buff.....***T. pubescens*** (Schumach.) Pilát
6–7 × 1.8–2.1 μm, L = 6.5 μm, W = 1.9 μm, Q = 3.4 (n = 30/1)

17. Pileal surface ochraceous to reddish brown .....***T. ochracea*** (Pers.) Gilb. & Ryvarden
5–7 × 2–2.8 μm, L = 6 μm, W = 2.4 μm, Q = 2.2–2.8 (n = 180/6)

18. Basidiospores 3–4 μm wide 19

18. Basidiospores < 3 μm wide 20

19. Basidiospores ellipsoid..... ***T. ljubarskyi*** Pilát
4.7–5.8 × 3–4 μm, L = 5.2 μm, W = 3.5 μm, Q = 1.5 (n = 30/1)

19. Basidiospores cylindrical..... ***T. mimetes***
10.2–12.8 × 3–4 μm, L = 11.6 μm, W = 3.5 μm, Q = 3.3 (n = 30/1)

20. Basidiospores < 4 μm long, basidiocarps pinkish brown to cocoa-colored, usually covered with cream to ochraceous outgrowth spreading from the base..... ***T. modesta*** (Kunze ex Fr.) Ryvarden
3.1–4 × 1.8–2.2 μm, L = 3.7 μm, W = 2.1 μm, Q = 1.6–2 (n = 210/7)

20. Basidiospores > 4 μm long, basidiocarps different.....21

21. Basidiospores mostly 1.5–2 μm wide 22

21. Basidiospores mostly 2–3 μm wide 23

22. Pileus applanate, white to buff, dissepiments rather thin, context unchanged in KOH . . . . . ***T. velutina*** (Pers.) G. Cunn.
5–6 × 1.8–2.1 µm, L = 5.7 µm, W = 1.9 µm, Q = 2.7–3.3 (n = 180/6)

22. Basidiocarps usually sub-stipitate, pileus in different gray shades, context turns to yellow in KOH. . . . . ***T. menziesii*** (Berk.) Ryvarden
5–6.3 × 1.8–2.1 µm, L = 5.6 µm, W = 2 µm, Q = 2.8 (n = 60/2)

23. Pores 5–6 per mm 24

23. Pores 3–5 per mm 25

24. Pileus flabelliform, thin and flexible, cream to pale tan, usually radial wrinkled when dry . . . . . ***T. membranacea*** (Sw.) Kreisel
4.5–6 × 2–2.5 µm (Gilbertson & Ryvarden 1987)

24. Pileus applanate, multizonate in tan to brown and sulcate, often turn to reddish brown from the base. . . . . ***T. ectypa*** (Berk. & M.A. Curtis) Gilb. & Ryvarden
4–5.8 ×2–2.3 µm, L = 4.4 µm, W = 2.1 µm, Q = 2.1 (n = 26/1)

25. Pileus cinnamon, basidiospores mostly < 5 µm long . . . . . ***T. maxima***
4.2–5.1 × 2–2.4 µm, L = 4.8 µm, W = 2.2 µm, Q = 2.2 (n = 30/1)

25. Pileus glabrous, cream to pinkish-buff to gray, basidiospores mostly >5 µm long 26

26. Pileal surface more or less grayish, distinctly tuberculate . . . . . ***T. manilaensis*** (Lloyd) Teng
5–7.8 × 2.2–3 µm, L = 6.3 µm, W = 2.5 µm, Q = 2.5 (n = 30/1)

26. Pileal surface cream-ochraceous to brown, more or less smooth . . . . . ***T. ochracea***
5–7 × 2–2.8 µm, L = 6 µm, W = 2.4 µm, Q = 2.2–2.8 (n = 180/6)

Other specimens examined — ***Trametes conchifera*** **CHINA**. **Heilongjiang Province**, Yichun, Fenglin Nature Reserve, on fallen trunk of *Ulmus*, 8.IX.2002 Dai 3670 (IFP); Ning'an County, Jingpohu Park, on fallen trunk of *Ulmus*, 8.IX.2007 Dai 8359 (IFP). **Inner Mongolia Autonomous Region**, Tongliao, Daqinggou Nature Reserve, on fallen angiosperm trunk, 24.IX.2002 Dai 3966 (IFP). **Jilin Province**, Antu County, Changbaishan Nature Reserve, on fallen angiosperm trunk, 12.XII.2007 Dai 9069 (IFP).

T. cystidiolophora. **CHINA**. **Yunnan Province**, Baoshan, Gaoligongshan Nature Reserve, on dead angiosperm tree, 25.X.2009 Cui 8084 & 8087 (BJFC).

T. ectypa. **CHINA**. **Zhejiang Province**, Lin'an County, Tianmushan Nature Reserve, on fallen angiosperm trunk, 9.X.2005 Cui 2580 (IFP).

T. elegans. **CHINA**. **Hainan Province**, Danzhou, on fallen angiosperm trunk, 7.V.2009 Cui 6293 (BJFC). **Guangdong Province**, Shixing County, Chebaling Nature Reserve, on fallen angiosperm trunk, 13.IX.2009 Cui 7398 (BJFC).

T. gibbosa. **CHINA**. **Zhejiang Province**, Lin'an County, Tianmushan Nature Reserve, on fallen trunk of *Liquidambar formosana*, 8.X.2005 Cui 2524 (IFP). **Jilin Province**, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Tilia*, 12.XII.2007 Dai 9026 (IFP). **Guangdong Province**, Shixing County, Chebaling Nature Reserve, on fallen angiosperm trunk, 12.IX.2009 Cui 7390 (BJFC).

T. hirsuta. **CHINA**. **Shandong Province**, Tai'an, Tai Mountains, on fallen trunk of *Populus*, 26.IX.2005 Cui 2496 (IFP); Linyi, Linyi Botanical Garden, on fallen angiosperm trunk, 17.VII.2009 Cui 6774 (BJFC). **Hainan Province**, Chengmai County, on fallen angiosperm trunk, 6.V.2009 Cui 6238 & 6241 (BJFC). **Fujian Province**, Wuyishan County, Wuyi Palace, on angiosperm stump, 29.VIII.2006 Cui 4190 (IFP). **Beijing**,

Beijing Botanical Garden, on living tree of *Prunus*, 9.VII.2008 Cui 5547 & 5549 (BJFC). **Anhui Province**, Huangshan County, Huangshan Mountains, on fallen trunk of *Prunus*, 10.X.2004 Dai 6034 (IFP). **Guangdong Province**, Ruyang County, Nanling Nature Reserve, on fallen trunk of *Castanopsis*, 14.V.2009 Dai 10883 & 10889(BJFC).

T. lactinea. **CHINA**. **Jilin Province**, Hunchun, Hadamen, on fallen trunk of *Quercus*, 7.VIII.2009 Cui 7084 (BJFC). **Jiangxi Province**, Jiujiang, Nanhu Park, on fallen angiosperm trunk, 10.X.2008 Cui 6097 (BJFC).

T. ljubarskyi. **CHINA**. **Henan Province**, Neixiang County, Baotianman Nature Reserve, on fallen angiosperm branch, 28.VIII.2005 Li 286 (IFP).

T. manilaensis. **CHINA**. **Hainan Province**, Danzhou County, on fallen trunk of *Acacia*, 7.V.2009 Dai 10747 (BJFC).

T. menziesii. **CHINA**. **Guangdong Province**, Ruyang County, Nanling Nature Reserve, on fallen angiosperm trunk, 16.IX.2009 Cui 7563, 7583, 7603 & 7613 (BJFC); Shixing County, Chebaling Nature Reserve, on fallen trunk of *Castanopsis carlesii*, 12.IX.2009 Cui 7360 (BJFC); on fallen angiosperm trunk, 13.IX.2009 Cui 7419 (BJFC); 14.IX.2009 Cui 7465 (BJFC).

T. modesta. **CHINA**. **Fujian Province**, Jian'ou County, Wanmulin Nature Reserve, on fallen angiosperm trunk, 30.VIII.2006 Cui 4210 (IFP). **Hainan Province**, Ledong County, Jianfengling Nature Reserve, on fallen angiosperm trunk, 18.XI.2007 Dai 9290 (BJFC); on fallen trunk of *Cyclobalanopsis*, 11.V.2009 Dai 10844 (BJFC); on fallen branch of *Syzygium*, 8.V.2009 Cui 6400 (BJFC); Changjiang County, Bawangling Nature Reserve, on fallen angiosperm trunk, 8.V.2009 Cui 6406 (BJFC); on living tree of *Cyclobalanopsis*, 8.V.2009 Cui 6407 (BJFC); on fallen trunk of *Sapium discolor*, 9.V.2009 Cui 6452 (BJFC). **Yunnan Province**, Mengla County, Xishuangbanna Tropical Botanical Garden, on fallen angiosperm trunk, 31.X.2009 Cui 8364 (BJFC).

T. ochracea. **CHINA**. **Hebei Province**, Xinglong County, Wulingshan Nature Reserve, on fallen angiosperm trunk, 29.VII.2009 Cui 6848 (BJFC); on fallen trunk of *Populus*, 30.VII.2009 Cui 6888 (BJFC). **Jiangsu Province**, Nanjing, Zijin Mountains, on fallen trunk of *Xylosma racemosa*, 3.VI.2005 Dai 6571 (IFP). **Jilin Province**, Antu County, on fallen trunk of *Betula*, 11.III.1993 Dai 898 (IFP); on Stump of *Betula*, 9.IX.1995 Dai 2005 (IFP). **Shaanxi Province**, Zhouzhi County, Taibai Mountains, on angiosperm stump, 24.X.2006 Yuan 2695 (IFP). **Shanxi Province**, Qinshui County, Lishan Nature Reserve, on fallen trunk of *Quercus*, 18.X.2004 Yuan 964 (IFP); Jiaocheng County, Pangquangou Nature Reserve, on fallen trunk of *Betula*, 22.IX.2006 Yuan 2477 (IFP). **Zhejiang Province**, Lin'an County, Tianmushan Nature Reserve, on angiosperm stump, 12.X.2005 Cui 2757 (IFP).

T. orientalis. **CHINA**. **Hainan Province**, Danzhou County, on fallen trunk of *Acacia,* 7.V.2009 Cui 6300 (BJFC). **Guangdong Province**, Ruyang County, Nanling Nature Reserve, on fallen angiosperm trunk, 17.IX.2009 Cui 7642 (BJFC).

T. pavonia. **CHINA**. **Taiwan Province**, Taichung, on fallen angiosperm trunk, VIII.1997 Dai 11596 (IFP).

T. pocas. **CHINA**. **Hainan Province**, Changjiang County, Bawangling Nature Reserve, on fallen angiosperm branch, 7.XII.2009 Dai 11577 (BJFC). **Yunnan Province**, Tengchong County, Gaoligong Mountains, on fallen angiosperm trunk, 25.X.2009 Cui 8074 (BJFC).

T. pubescens. **CHINA**. **Hebei Province**, Xinglong County, Wulingshan Nature Reserve, on fallen angiosperm trunk, 30.VII.2009 Cui 6902 (BJFC). **Jilin Province**, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Populus*, 19.IX.2002 Dai 3824 (IFP). **Guangdong Province**, Shixing County, Chebaling Nature Reserve, on fallen angiosperm trunk, 14.IX.2009 Cui 7464 (BJFC).

T. suaveolens. **CHINA**. **Shanxi Province**, Ningwu County, Fengxiang Mountains, on fallen trunk of *Salix*, 8.IV.2009 Dai 10729 (BJFC). **Heilongjiang Province**, Ning'an County, Jingpohu Park, on fallen trunk of *Betula*, 10.IX.2007 Dai 8888 (IFP).

T. subsuaveolens. **CHINA**. **Inner Mongolia Autonomous Region**, Chifeng, Baiyinaobao Nature Reserve, on fallen trunk of *Picea*, 19.IX.2003 Cui 269 & 258 (IFP).

T. velutina. **CHINA**. **Shaanxi Province**, Zhouzhi County, Taibai Mountains, on fallen angiosperm trunk, 24.X.2006 Yuan 2628 (IFP); Foping County, Foping Nature Reserve, on stump of *Quercus*, 27.X.2006 Yuan 2774 (IFP). **Jilin Province**, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Betula*, 1.IX.1993 Dai 971 (IFP); 11.IX.1995 Dai 2135 (IFP); on fallen decorticated trunk of *Acer*, 11.IX.1995 Dai 2008 (IFP). **Liaoning Province**, Kuandian County, Tianhuashan Nature Reserve, on fallen branch of *Betula*, 29.VII.2008 Cui 5625 (BJFC).

T. versicolor. **CHINA**. **Jilin Province**, Antu County, Changbaishan Nature Reserve, on fallen angiosperm trunk, 13.IX.2007 Dai 9156 (IFP). **Hebei Province**, Xinglong County, Wulingshan Nature Reserve, on stump of *Betula*, 29.VIII.2009 Cui 7182 (BJFC).

Discussion

Trametes species are not well known in China, and more samples and molecular data are needed to define them. *Trametes cervina* (Schwein.) Bres. (Bresadola 1903) was transferred to *Funalia* Pat. based on its cyanophilous skeletal hyphae (Dai 1996), but nuclear LSU and mtSSU rDNA sequence analyses support its transfer to the new genus *Trametopsis* Tomšovský, as *Trametopsis cervina* (Schwein.) Tomšovský (Tomšovský 2008). Based on its unusual sterile disc- or cup-shaped structures *T. conchifera* was recognized as *Poronidulus conchifer* (Schwein.) Murrill (Murrill 1904). However, its hyphal structure and spores are typical of *Trametes*, where we retain it. One specimen (HMAS 23451) representing *T. drummondii* (Klotzsch) Ryvarden, previously was recorded in China (Zhao 1998) was found to be sterile, making that species uncertain in the country. *Trametes elegans* was considered to represent *Lenzites* (Núñez & Ryvarden 2001) because of its irregular, partly lamellate pores, but molecular data indicate it is closely related to *Trametes* (Tomšovský et al. 2006), where we also place it. Núñez & Ryvarden (2001) transferred *T. scopulos*a (Berk.) Bres. to *Whitfordia* Murrill based on its laterally stipitate or sub-stipitate basidiocarps with a blackish cuticle near the base and coloured vegetative hyphae; molecular analyses are needed to support this placement. *Trametes thujae* J.D. Zhao was described on *Cupressaceae* from southwestern China (Zhao & Zhang 1991); Dai & Yuan (2010) place it in *Funalia* based on its coarsely tomentose to hirsute pileus and cyanophilous skeletal hyphae.

Funalia is usually treated as a synonym of *Trametes*. Both genera share trimitic hyphal system and more or less similar basidiospores, but the skeletal hyphae are cyanophilous in *Funalia* and acyanophilous in *Trametes* (Dai 1996, Niemelä et al. 1992). *Earliella* Murrill is undoubtedly related to *Trametes* by sharing the same type of hyphal system and basidiospores (Núñez & Ryvarden

2001). *Earliella* has resupinate to effused-reflexed basidiocarps with a reddish upper surface and sinuous pores. However, effused-reflexed basidiocarps and sinuous pores are also present in some *Trametes* species. Therefore, these characters may not be sufficient to separate them, and further studies are needed to revise the relationships of the two genera.

Lenzites Fr., which is closely related to *Trametes*, has lamellate pores and a characteristic catahymenium with pointed skeletal hyphae. *Coriolopsis* Murrill, *Fomitella* Murrill, and *Hexagonia* Fr. deviate from *Trametes* by their brown colours (Cui et al. 2010, Hattori 2005, Núñez & Ryvarden 2001). Further studies are needed to delimitate the above-mentioned genera from *Trametes*.

Microporus P. Beauv. seems closely related to *Trametes* because both have similar spores and hyphal structure, but *Microporus* is characterized by stipitate basidiocarps, small pores (5–10 per mm), and (for some species) coralloid dendrohyphidia in the dissepiments (Núñez & Ryvarden 2001).

Pycnoporus P. Karst. is similar to *Trametes* in all characters except its bright reddish-orange colour (Núñez & Ryvarden 2001, Ryvarden & Johansen 1980). According to our experience, its bright colour does not last and fades with age. Although analyses of LSU and ITS (nrDNA) sequences by Tomšovský et al. (2006) place *Pycnoporus* inside the paraphyletic *Trametes* clade, for the time being we retain *Pycnoporus* as an independent genus.

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